CLAIMS

We Claim:

1. An opto-electronic module having an optical port and an electrical port comprising:

a first substrate having electrical traces, a port end, and an interior end;

an opto-electronic device attached to and electrically connected to the first substrate wherein the opto-electronic device serves as the optical port;

a second substrate having electrical traces, the second substrate having a port end and an interior end, wherein the port end forms the electrical port; and

a flex connector that is a flexible band containing a plurality of electrically conductive wires, wherein the flex connector connects the electrical traces within first and the second substrates, whereby the flex connector allows for the adjustable positioning of the height of the optical port with respect to the height of the electrical port.

2. An opto-electronic module as recited in claim 1 wherein the flexible band of electronic transmission lines is suitable for transmitting differential signals between the first and the second substrate.

3. An opto-electronic module as recited in claim 2 wherein the flexible band of electrical transmission lines is connected to the interior end of the second substrate and the interior end of the first substrate.

4. An opto-electronic module as recited in claim 1 wherein the opto-electronic device further comprises:

a semiconductor device package that includes,

a semiconductor die that is at least partially encapsulated within a protective molding material;

electrical contacts formed on a top surface of the semiconductor die such that that the contacts are exposed through a surface of the protective molding material;

an optical device package that is mounted to the surface of the protective molding material such that the optical device package is electrically connected to the exposed electrical contacts.

5. An opto-electronic module as recited in claim 4 wherein the optical device package further comprises:

at least one photonic device suitable for receiving or sending optical signals; and

a support block to which the at least one photonic device is attached, wherein the at least one photonic device is electrically connected to the exposed electrical contacts of the semiconductor package via electrical circuitry within or on the surface of the support block.

6. An opto-electronic module as recited in claim 5 wherein there are more than one photonic devices attached to the support block, wherein at least one photonic device is configured to receive optical signals and at least one photonic device is configured to send optical signals.

7. An opto-electronic module as recited in claim 5 further comprising:

an electrical converter that is located within or on the surface of the support block such that singled ended signals travel between the photonic device and the electrical converter, wherein the electrical converter converts single ended signals from the photonic device into differential signals such that differential signals are transmitted to the electrical port and wherein the electrical converter converts differential signals from the electrical port into single ended signals that are transmitted to the photonic device.

8. An opto-electronic module as recited in claim 5 wherein the opto-electronic device is attached along the port end of the first substrate and the photonic device is mounted on a face of the support block that faces the port end of the first substrate.

9. An opto-electronic module as recited in claim 4 further comprising:

a barrel unit that is attached to the optical device package, the barrel unit having at least one hollow tube that provides optical access to the optical device package.

10. An opto-electronic module as recited in claim 1 wherein the opto-electronic device further comprises:

a semiconductor device package having a semiconductor die that is at least partially encapsulated within a protective molding material; and

an optical device package that is in electrical communication with the semiconductor device package.

11. An opto-electronic module as recited in claim 10 wherein the optical device package further comprises:

at least one photonic device suitable for receiving or sending optical signals.

12. An opto-electronic module as recited in claim 1 wherein the first substrate further comprises:

at least one electronic device attached to a surface of the first substrate wherein the electronic device is secured to a position that is directly adjacent to the semiconductor package.

13. An opto-electronic module as recited in claim 1 wherein the first substrate is substantially rigid.

14. An opto-electronic module as recited in claim 1 wherein the second substrate has a top surface and a bottom surface, and wherein the electrical port includes electrical contacts on the top surface, bottom surface, or top and bottom surfaces of the second substrate.

15. An opto-electronic module as recited in claim 1 wherein the first and second substrates are printed circuit boards.

16. An opto-electronic module as recited in claim 1 wherein the electrical and the optical ports face in opposite directions.

17. An opto-electronic module as recited in claim 1 wherein the second substrate is substantially rigid.

18. An opto-electronic module as recited in claim 1 wherein the first and second substrates are substantially rigid.

19. An opto-electronic module as recited in claim 1 wherein the opto-electronic module is suitable for sending, receiving, or sending and receiving data signals at a rate of approximately 2.5 Giga bytes per second or greater.

20. An opto-electronic module as recited in claim 1 further comprising:

a case that contains the opto-electronic module wherein the case has an optical interface opening to provide access to the optical port and an electrical interface opening to provide access to the electrical port.

21. An opto-electronic module as recited in claim 1 wherein the flex connector is integrally formed with the first and the second substrate.

22. An opto-electronic system comprising:

two parallel substrates, each substrate having an inside surface wherein the inside surfaces face each other;

an opto-electronic unit attached to each of the inside surfaces of the substrates, each of the opto-electronic units including,

a first circuit board that is attached to the inside surface of one of the substrates;

a second circuit board that is positioned substantially coplanar to and adjacent to the first circuit board;

a flexible band of electrical transmission lines that connects and provides electrical communication between the first and second circuit board;

an optical device that is directly or indirectly attached to a surface of the second circuit board;

wherein the optical device of each opto-electronic unit face each other such that optical signals can be transmitted between each of the optical devices.

23. An opto-electronic system as recited in claim 22 further comprising:

an optical fiber that facilitates the transmission of optical signals between each of the optical devices.

24. An opto-electronic system as recited in claim 22 further comprising:

a back plane which supports both of the substrates.

25. An opto-electronic module having an optical port and an electrical port comprising:

a first substrate having electrical traces, a port end, and an interior end;

an opto-electronic device attached to and electrically connected to the first substrate wherein the opto-electronic device serves as the optical port;

a second substrate having electrical traces, the second substrate having a port end and an interior end, wherein the port end forms the electrical port; and

an intermediate substrate containing a plurality of electrically conductive traces, wherein the intermediate substrate connects the electrical traces within first and the second substrates, wherein a thickness of the intermediate substrate separates the height of the optical port with respect to the height of the electrical port by a desired distance.

26. An opto-electronic module as recited in claim 25 wherein the intermediate substrate is suitable for transmitting differential signals between the first and the second substrate.

27. An opto-electronic module as recited in claim 25 wherein the intermediate substrate is sandwiched between the second substrate and the first substrate.